

MODELLING THE ANTARCTIC LOWER STRATOSPHERE

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We will present results from modelling studies of the Antarctic lower stratosphere which have attempted to simulate the large springtime ozone losses and corresponding changes in other trace constituents. These studies were carried out in a photochemical box model, a one-dimensional model without transport and in a two-dimensional photochemical-dynamical-radiation model.

The photochemical studies have investigated inter alia the sensitivity of ozone to inclusion in the model of heterogeneous chemistry, and to the inclusion of the ClO dimer. When both of these are incorporated in the model, ozone depletions resembling those found in Halley Bay in 1987 (J.C. Farman, Nature, 329, 1987) can be reproduced. We will discuss the temporal variations (both diurnal and during the August to October period) of a number of important tracers including HCl, ClONO₂, OCIO and BrO.

The two-dimensional study has concentrated on the difficulty of establishing in the model the dynamical preconditioning of the lower polar stratosphere - low temperatures, low N₂O, etc, high ClO_x. We will present calculations to show: (i) the depletion of ozone during the springtime season, (ii) the effect of large ozone losses on lower latitudes and (iii) the longer term (multi-year) variations of ozone in Antarctica, assuming realistic increases in the atmospheric halogen burden.